

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appln No.: 10/629,642

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Applicant: John W. EVANS

Title: NON-AQUEOUS HEAT TRANSFER
FLUID AND USE THEREOF

Art Unit: 1751

Examiner: Ogden Jr., Necholus

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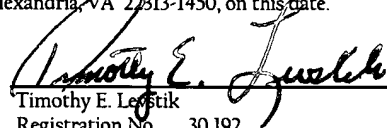


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4/17/05
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DECLARATION OF EVANS PURSUANT TO 37 C.F.R. §1.132

Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-13

Sir:

Inventor, John W. Evans, pursuant to 37 C.F.R. §1.132, declares as follows:

1. I am the inventor for the above-referenced patent application.

2. I have reviewed an article entitled "Evaluation of Non-Aqueous Propylene Glycol as an Engine Coolant for Heavy Duty Diesel Engines", by Coughenour et al., an article entitled "Aqueous and Non-Aqueous Engine Coolants Based On Propylene Glycol" by Dingley, United States Patent No. 5,240,631 to Mascioli et al., and United States Patent No. 5,422,026 to Greaney, and United States Patent No. 5,387,360 to Uekusa et al.

3. The Coughenour and Dingley articles describes the use of 100% propylene glycol as a coolant without addition of propylene glycol soluble additives. The Coughenour article concludes in pertinent part

“Non-aqueous propylene glycol demonstrates extremely good engine cooling system corrosion protection and cylinder liner cavitation suppression. It also provides a greater margin of boil-over and vapor blanketing protection at a lower cooling system operating pressure. Cavitation damage in the coolant pump should be eliminated. Cooling system maintenance and chemical addition should be greatly simplified.”

4. Mascioli, Greaney and Uekusa describe the use of molybdate, nitrate or azole compounds in an aqueous coolant.

5. As of the time of the filing of the parent of the instant application in 1993, a person having ordinary skill would have not understood Mascioli, Greaney and Uekusa to suggest adding corrosion inhibition additives, such as molybdates, nitrates or azoles without buffering, to a completely non-aqueous coolant because, as discussed more fully below, those with ordinary skill would have been taught either (a) a fear of water, and hence, buffering and corrosion inhibition additives were needed, or (b) a person of ordinary skill would have thought such additives would not have been necessary in a coolant where there was no water with which to create a corrosion or cavitation problem. What was surprising and unexpected was that such corrosion inhibition additives would have been needed in a neat or non-aqueous coolant system where heat and propylene glycol created an unexpected corrosion problem.

6. I have reviewed U.S. Patent No. 5,031,579, of which I am also an inventor.

7. The '579 patent describes the use of 100% propylene glycol as a coolant. The '579 teaches one of ordinary skill the fear of water in a propylene glycol cooling system. A desiccant material is even used to make sure that the coolant in the system remains moisture free. See column 10, lines 55-68. As of 1993 a person of ordinary skill would have seen the propylene glycol coolant of the

'579 patent, i.e. without any buffering and corrosion inhibiting additives, would only be acceptable for short term usage, since the lack of additives would result in reactions with metals in the system and subsequent and rapid deterioration of the coolant.

8. Because of a fear of water for one of ordinary skill in the art as of 1993, such a person would not have understood the '579 patent to suggest the use of 100% propylene glycol with corrosion inhibition additives and without the use of a buffer to reduce acidity for a commercially viable coolant. Instead, one of ordinary skill in the art would have added a buffer along with corrosion inhibition additives to the 100% propylene glycol of the '579 patent because one of ordinary skill would expect that a buffer would be needed to reduce acidity. One of ordinary skill in the art, based on the '579 patent, ***would not have used a non-buffered propylene glycol composition with corrosion inhibition additives*** because of the belief that high acidity associated with even trace amounts of water in the composition, which normally results from gradual absorption of water during use in an engine, caused an unacceptable risk of corrosion.

9. Moreover, at about the time of the '579 patent and a bit later, Coughenour knowing about the '579 patent concluded that “[N]on-aqueous propylene glycol demonstrates extremely good engine cooling system corrosion protection and cylinder liner cavitation suppression” and that “[C]ooling system maintenance and chemical addition should be greatly simplified.” This statement and the Coughenour and Dingley articles suggest that 100% propylene glycol would not need corrosion inhibitor additives because they were not needed and a person having ordinary skill would not want to add corrosion inhibitors were they were not needed, “chemical addition should be greatly simplified.”

10. I have read PCT/US89/01544 (Reny et al.). The Reny et al. publication does not exemplify coolant compositions which contain less than 0.5 weight percent water. Indeed, Reny's

compositions can have almost 10 weight percent water which would have been feared as corrosive and would have been viewed as needing buffers and corrosive inhibiting additives.

11. At page 2, line 18, Reny et al. describe two of my patents USP Nos. 4,550,694 and 4,630,572 and says these related to systems with little or no water. That is not true, propylene glycol systems were thought to have water in them. Both of these patents describe propylene glycol cooling systems, but because propylene glycol is miscible with water, it was thought such systems were hygroscopic and were assumed to have water present. See column 17, lines 26-33 of the '694 patent which says:

If the coolant is miscible with water and a small amount of water is in solution with the coolant, most of the coolant vapor will condense within coolant liquid that is lower in temperature than the saturation temperature of the coolant and higher in temperature than the saturation temperature of water, but not all of it. Coolants miscible with water are hygroscopic and should be assumed to contain some water..

In the same paragraph describing my patents (which assumed propylene glycol coolants had water), when Reny said that "uninhibited glycols used as anhydrous coolants are corrosive to a typical cooling system components...", a person of ordinary skill would have understood Reny as seeing such systems as corrosive because they were assumed to have water in them as an undesirable element. See column 13, lines 34-41 of the '694 patent. At least a portion of those skilled in the art (except for those like Coughenour and Dingley) thought "anhydrous propylene glycol systems" had water in them because they were hygroscopic. In any event, even if Reny did mean that the propylene glycol systems he was referring to were completely without water, as I have stated below, Reny did not suggest any corrosion inhibitors that would work in systems that had essentially no water.

12. Unexpectedly, and opposed to what would have been expected by one of ordinary skill in the art, the present invention ***does not require the addition of buffer*** or more than about 0.5 weight percent water ***with the addition of propylene glycol soluble corrosion inhibiting additives***. This is because a coolant with less than 0.5 weight percent water with the remainder of propylene glycol unexpectedly dehydrates itself when subjected to engine heat and a low system pressure, and

does not gather corrosive water. Moreover, the use of a molybdate salt, a nitrate compound and/or azole compound in a propylene glycol coolant with less than 0.5 weight percent water would not have necessarily been seen as a corrosion inhibitor in a system with essentially no water. Corrosion in such a system would come from the propylene glycol and not water. It would not have been obvious to a person of ordinary skill that a system with essentially no water would have been corrosive in an engine cooling system, and possibly more important, whether corrosion inhibitors that worked in systems with water or at least some water would work in systems that had essentially no water.

13. If a person of ordinary skill as of 1993 concluded that despite being hygroscopic, a system with 100% propylene glycol did not need additives because as stated by Coughenour “[N]on-aqueous propylene glycol demonstrates extremely good engine cooling system corrosion protection...”, that person would not have added additives because they could be deleterious to a cooling system. For example, (a) if additives were thought to be needed because of water in the propylene glycol coolant and if in reality the understanding was that you did not have water in the system—no additives would have been thought needed; (b) additives react with each other causing problems; (c) additives were known to not stay in solution/suspension without water; and (d) additives tend not to stay in solution/suspension without balancing their relative amounts and agitation. If additives fall out of solution/suspension, merely agitating the coolant would not cure the problem because when they fall from solution/suspension, the additives congeal at low point (regions) in the cooling system.

14. With the non-buffered propylene glycol coolant of the invention, the additives do not fall from solution/suspension without water. The coolant can be stored for years without congealing. Moreover, the additives do not fall from solution/suspension during use because of a lack of water or an imbalance in relative additive amounts where the imbalance has developed over time and use. In a test vehicle, we have run the non-buffered coolant of the invention for about 1,000,000 miles

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Declaration

without significant loss of additives, without the additives falling out of solution/suspension and
without significant corrosion of the components which are in contact with the coolant.

The undersigned, being warned that willful false statements and the like are punishable by fine or imprisonment, or both (18 U.S.C. §1001) and may jeopardize the validity of the application or any patent issuing thereon, hereby declares that the above statements made of my own knowledge are true and that all statements made on information and belief are believed to be true.

Date: 4/15/05

John W. Evans
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APPENDIX 1 (CLAIMS 1-8)

1. A method of cooling a heat exchange system which comprises circulating a composition in said system, said composition comprising at least about 94.5 weight percent non-buffered propylene glycol, and about 0.05 to about 5.0 weight percent of at least one propylene glycol soluble additive selected from the group consisting of a molybdate salt, a nitrate compound and an azole compound, the composition comprising less than about 0.5 weight percent water.

2. The method of claim 1 wherein said molybdate salt is sodium molybdate.

3. The method of claim 1 wherein said nitrate compound is sodium nitrate.

4. The method of claim 1 wherein said azole compound consists of tolyltriazole.

5. The method of claim 1 wherein said propylene glycol is present in a concentration of about 94.5% to about 99.85% by weight, and the propylene glycol soluble additive comprises a mixture of sodium molybdate, sodium nitrate and tolyltriazole.

6. The method of claim 1 wherein said propylene glycol is present in a concentration of greater than about 99.0% by weight, and said propylene glycol soluble additive comprises a mixture of about 0.3% sodium molybdate by weight, about 0.3% sodium nitrate by weight, and about 0.3% tolyltriazole by weight.

7. The method of claim 1 wherein the heat exchange system is an internal combustion engine heat exchange system.

8. The method of claim 1 wherein the heat exchange system is a motor vehicle engine heat exchange system.